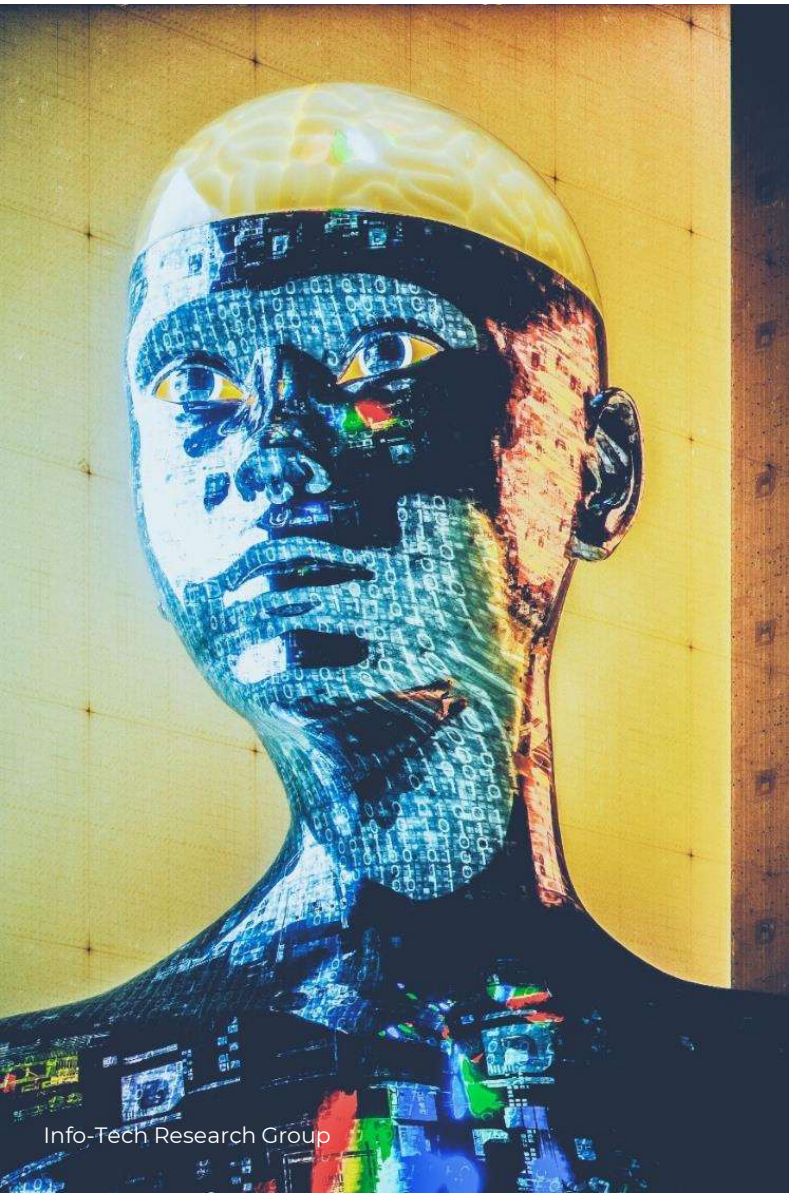
INFO-TECH LIVE EVENTS

Demystifying AI

Presented by

Natalia Modjeska



The hype: AI is everywhere…

"AI: The Killer App for Your Business"
(Forbes, "Killer App," 2018)

"Meet Your New Employee" (HBR, 2015)

"The AI Doctor Will See You Now" (WSJ, n.d.)

"Intelligent Machines Will Replace Teachers Within 10 Years" (Independent, 2017)

"Anything You Can Do, AI Can Do Better"
(The Economist, n.d.)

"Machines Will Replace Humans at the Top - and Wipe Us Out if We Dare to Resist"
(Express, 2019)

What's in a Revolution?

Revolutions are caused by technological advances that **fundamentally reshape** key aspects of the world, such as commerce, health care, learning, and the environment. The following are some of the revolutions that have shaped who we are today and how our society functions:

1700s-1940s

First Industrial Revolution

The mechanized spinning of textiles, large-scale manufacturing of chemicals, steam power, and efficiencies in iron-making sparked the first Industrial Revolution (1760-1840).

Second Industrial Revolution

Railroads, the telegraph and telephone, and electricity and other utilities sparked the second Industrial Revolution (1870-1940).

1940s-Present

Scientific Revolution

Radio, aviation, and nuclear fission sparked the Scientific/Technical Revolution (1940-1970).

Information Revolution

The internet and digital media and devices caused/is causing the Information Revolution (1985-present).

Present

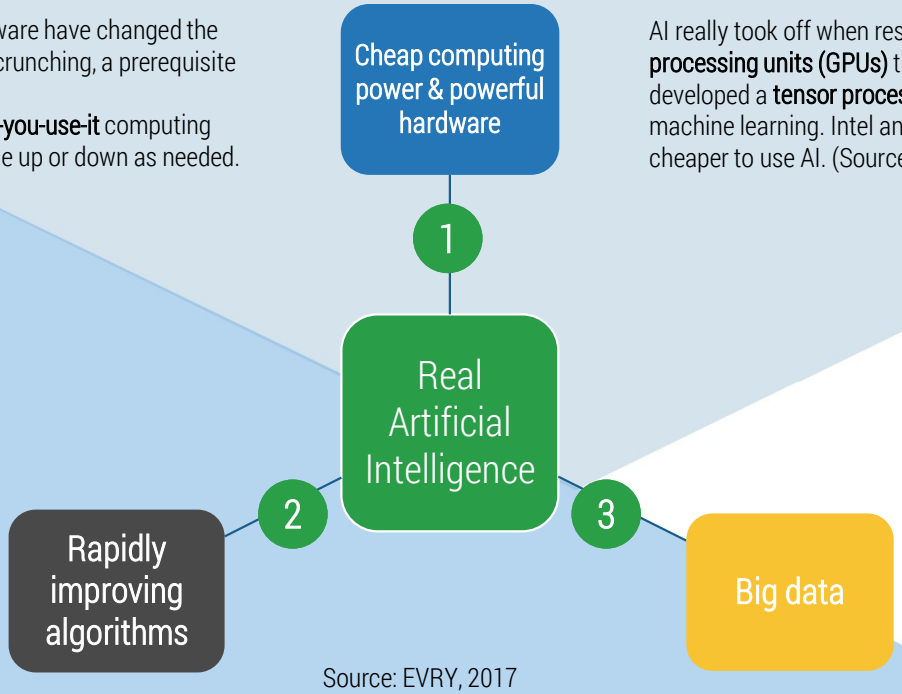
AI Revolution

We are currently undergoing a radical shift in how we engage with each other, organize our society, and ultimately how we know ourselves. Thanks to the building blocks laid down by previous revolutions (electricity, hyper-connectivity, and communication technology, for example) and rapid improvements in AI technology, we can predict, automate, and interact in ways that couldn't have been imagined in other revolutions' times.

Why Now?

We have all heard grandiose promises of technologies before, and more often than not we are disappointed by the limitations or reality of the technology. AI is an old culprit of this. However, this time it's different. Three **realities** in the business world support this view:

Cloud computing and commodity hardware have changed the game when it comes to heavy number crunching, a prerequisite for AI technologies.
The major cloud platforms offer **pay-as-you-use-it** computing options, which means that you can scale up or down as needed.



Source: EVRY, 2017

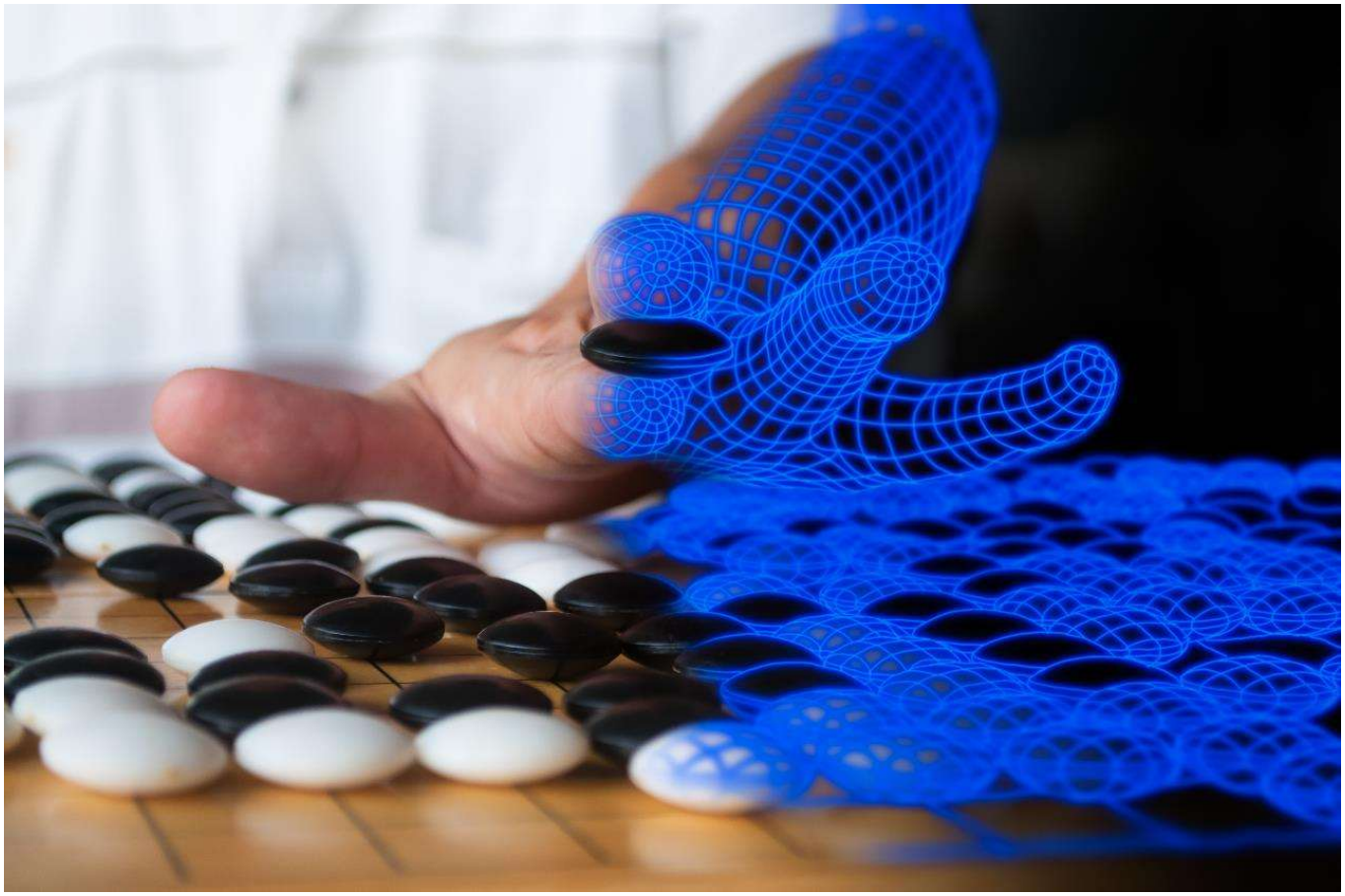
AI really took off when researchers started to employ **graphics processing units (GPUs)** traditionally used in gaming. Google recently developed a **tensor processing unit (TPU)** specifically for neural net machine learning. Intel and Facebook are working on a chip to make it cheaper to use AI. (Source: Medium, "Cheaper AI for Everyone," 2019)

Learning is the key to modern AI. It is incredibly difficult to write a program that can act on a strict logical basis with the exponentially growing amount of data that is generated every day. Instead, AI needs to be able to make decisions about what information is important, and what is not.

AI sits on a foundation of **large amounts of data,** which is required for learning. Organizations today are capable of harvesting large volumes of data of **increasing varieties,** and AI is how these organizations are capitalizing on their big data investments.

AlphaGo

Source: Wikipedia, "Lee Sedol in 2012," 2012, Public Domain



Replica of Zuse Z3 at Deutsches Museum in Munich

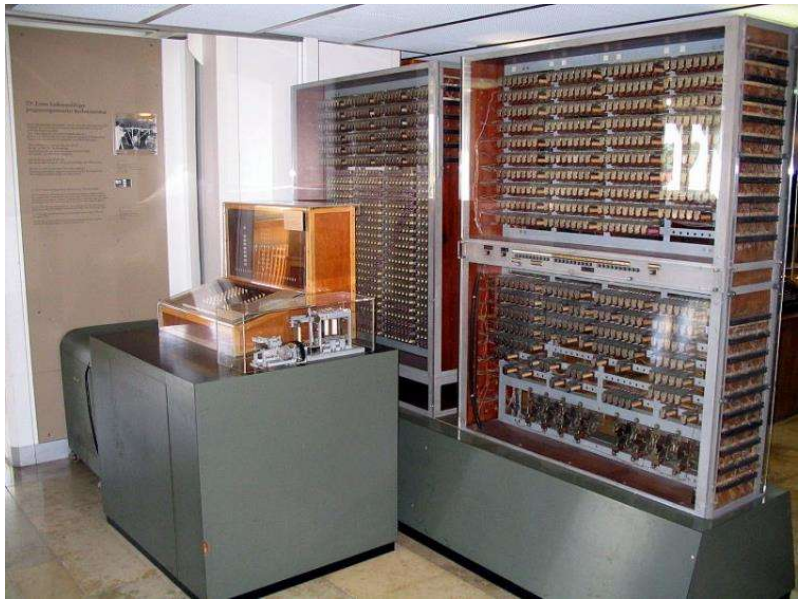


Image source: Wikipedia, "File:Z3 Deutsches Museum.JPG," 2006, Public Domain

Mary Jackson, mathematician and aerospace engineer, working at the Langley Research Center

Image source: Wikipedia, "File:Mary Jackson working.jpg," 1977, Public Domain

“We propose that a 2-month, 10-man study of artificial intelligence be carried out…”

Image source: Computer Science Museum, used with permission

“[…] on the basis of the conjecture that **every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.**

An attempt will be made to find how to **make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and *improve themselves.*** We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.”

Source: “A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence,” 1955

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Image source: Computer Science Museum, used with permission

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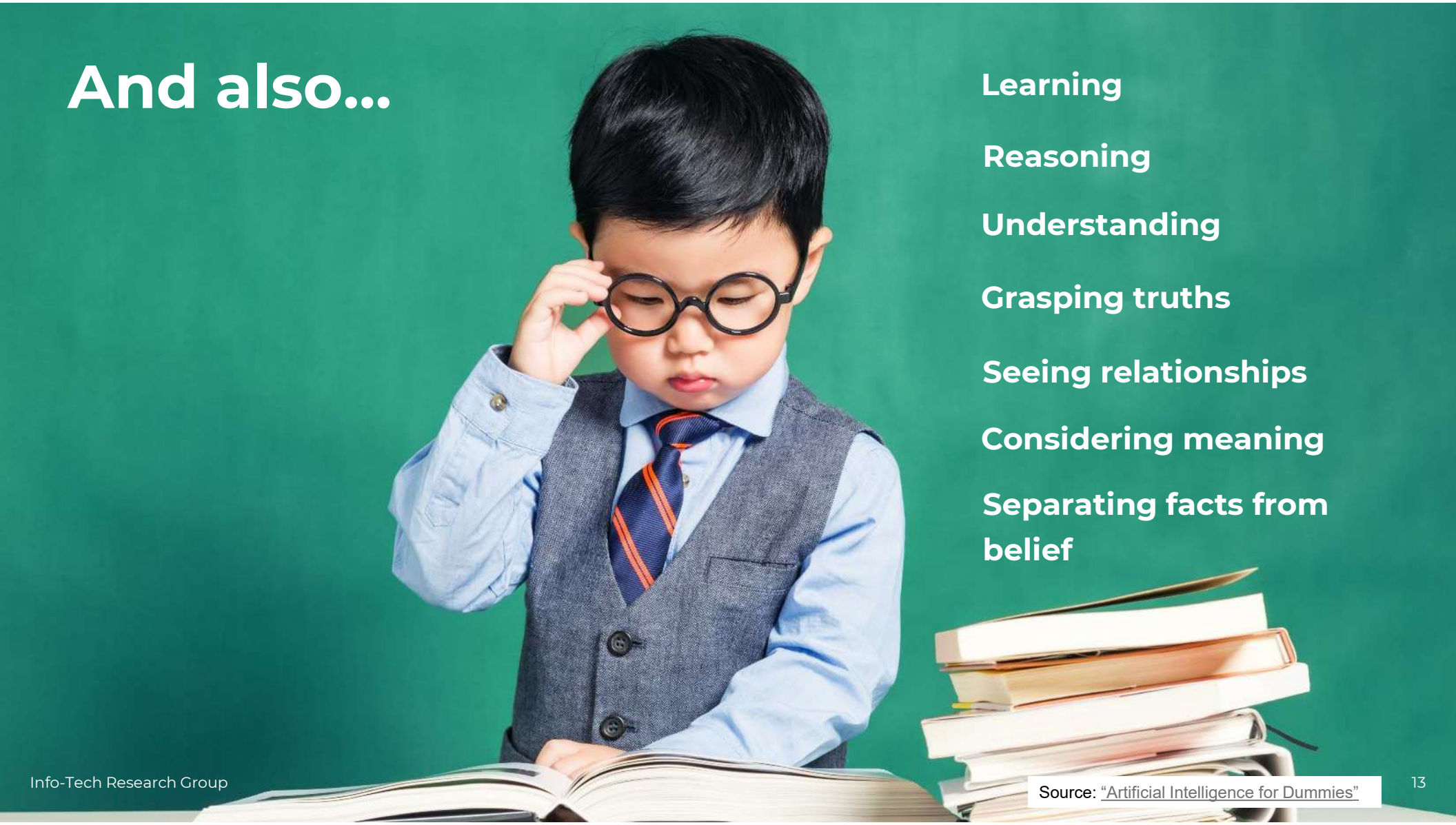
What Is (Human) Intelligence?

The ability to understand language...

Navigate in the visual world...

Manipulate objects...

And also…



Learning

Reasoning

Understanding

Grasping truths

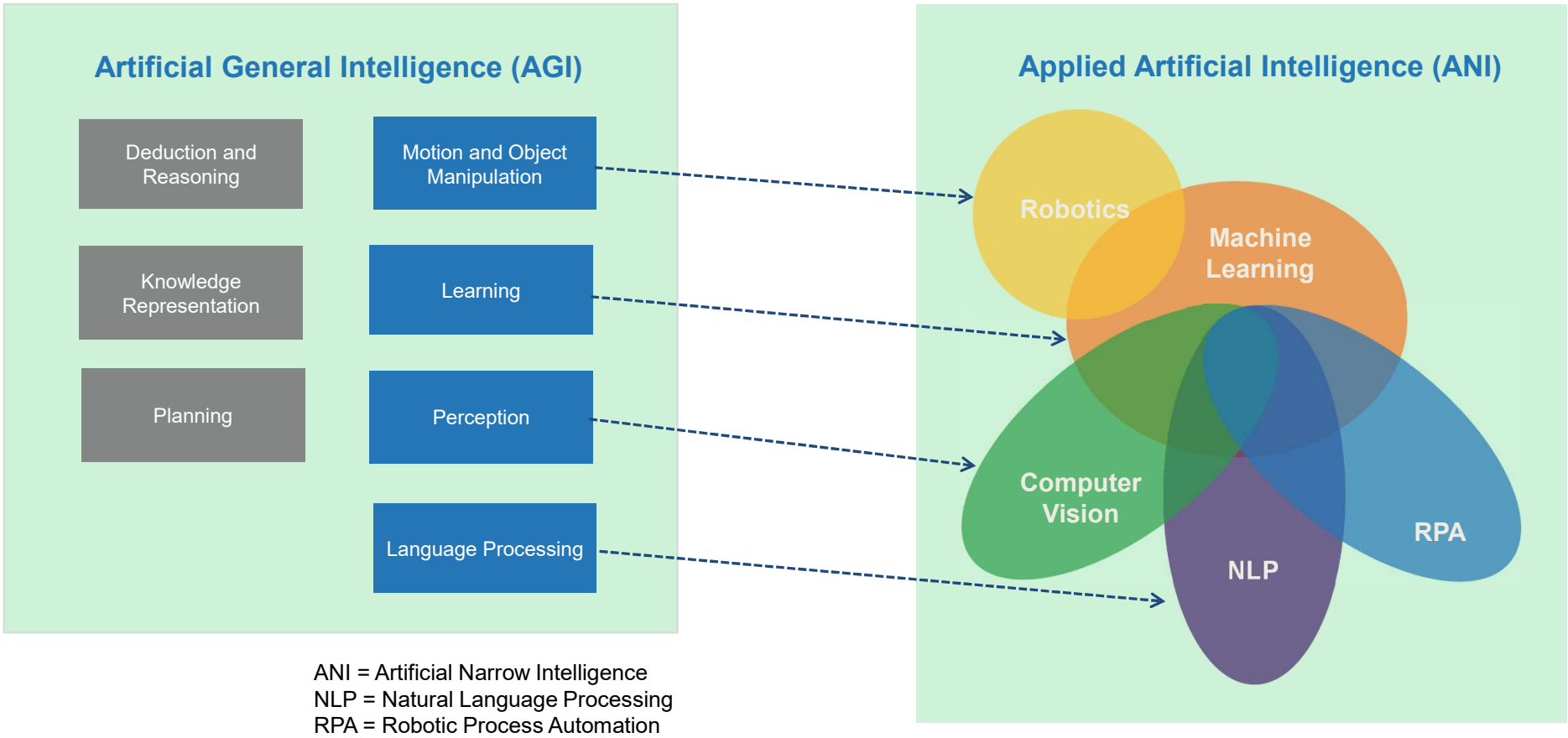
Seeing relationships

Considering meaning

Separating facts from belief

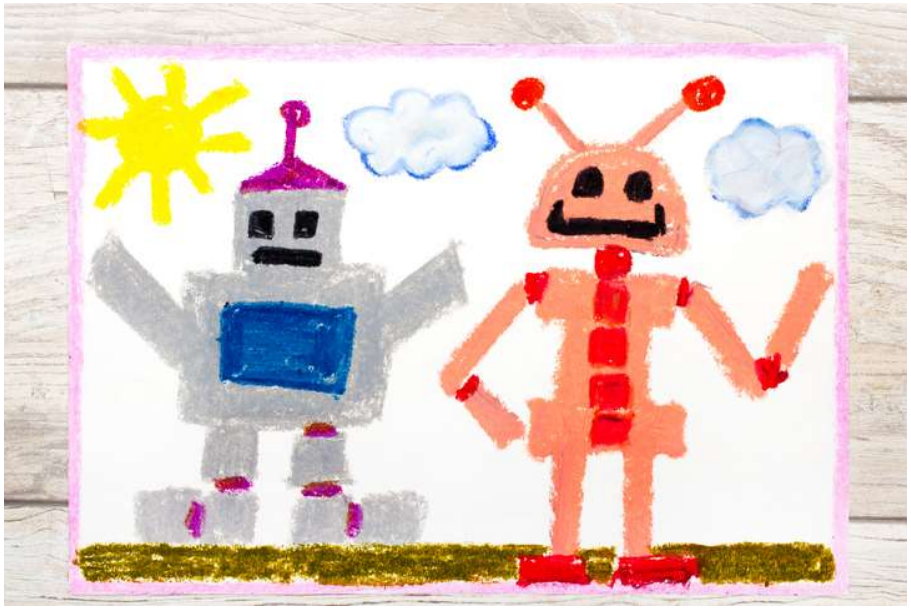
Source: "Artificial Intelligence for Dummies"

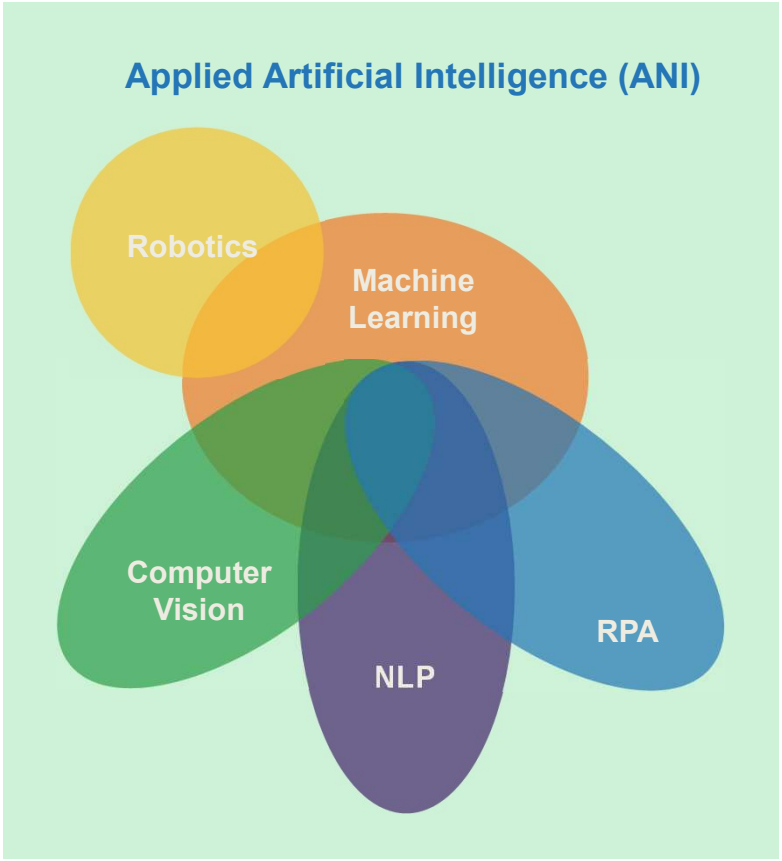
What's taking the world by storm is AAI (ANI)



ANI = Artificial Narrow Intelligence
NLP = Natural Language Processing
RPA = Robotic Process Automation

Current state of AI is below a six-year-old





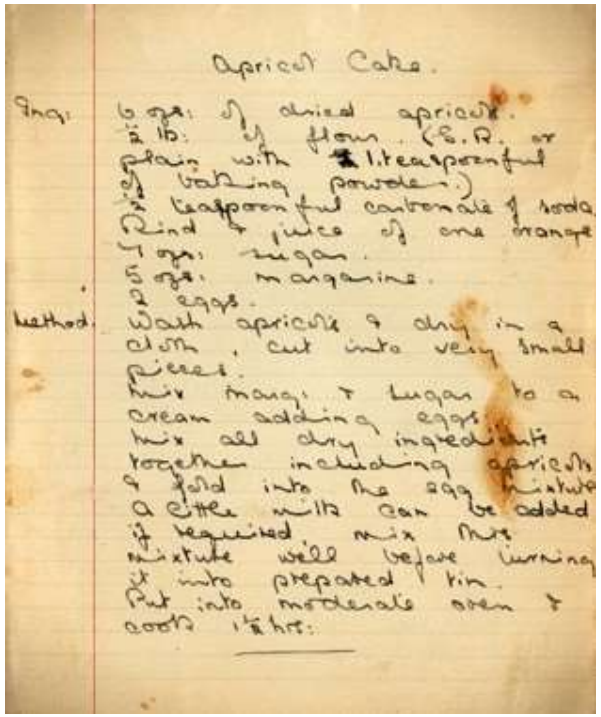
Machine learning (ML)

is the scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on patterns and inference instead.

Source: Wikipedia

Machine learning = big data + algorithms

+



Apricot Cake.

Ingr: 6 ozs: of dried apricots.
6 ozs: of flour. (S.R. or plain with 1 teaspoonful baking powder.)
1 teaspoonful carbonate of soda
Rind & juice of one orange
4 ozs: sugar.
4 ozs: margarine.
2 eggs.

Method. Wash apricots & dry in a cloth, cut into very small pieces.
Mix marg: & sugar to a cream adding eggs.
Mix all dry ingredients together including apricots & fold into the egg mixture a little milk can be added if required mix this mixture well before turning it into prepared tin.
Put into moderate oven & cook 1½ hrs.

70% of machine learning models in use are “supervised” – they have been trained on data that has been labeled by humans

What's a supervised learning model?

Model: a mathematical representation of a real-world decision process

House price =
w1 * number of bedrooms +
w2 * number of bathrooms +
w3 * square footage +
w4 * neighborhood + etc.*

**w1-w4* are weights, i.e. importance of each factor

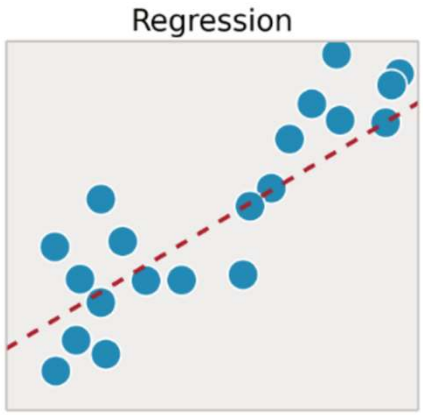


Image source: Kathryn Hume, used with permission

Another example: classification

Use **“free money”** or **“out of debt”** to predict if emails are spam

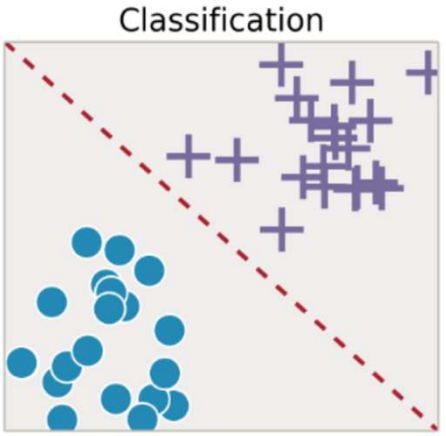


Image source: Kathryn Hume, used with permission

What should we do here?

1) Find a proxy (P) for something hard to know (C).
2) Find a function that defines a correlation between P and C.
3) Use this function to make **guesses** about C.

What P should we pick to decide if it's a cat or dog?

Source: Kathryn Hume

Enter deep learning aka neural nets

Use layers to transform complex input into mathematical expressions and remove the need for humans to select which features matter.

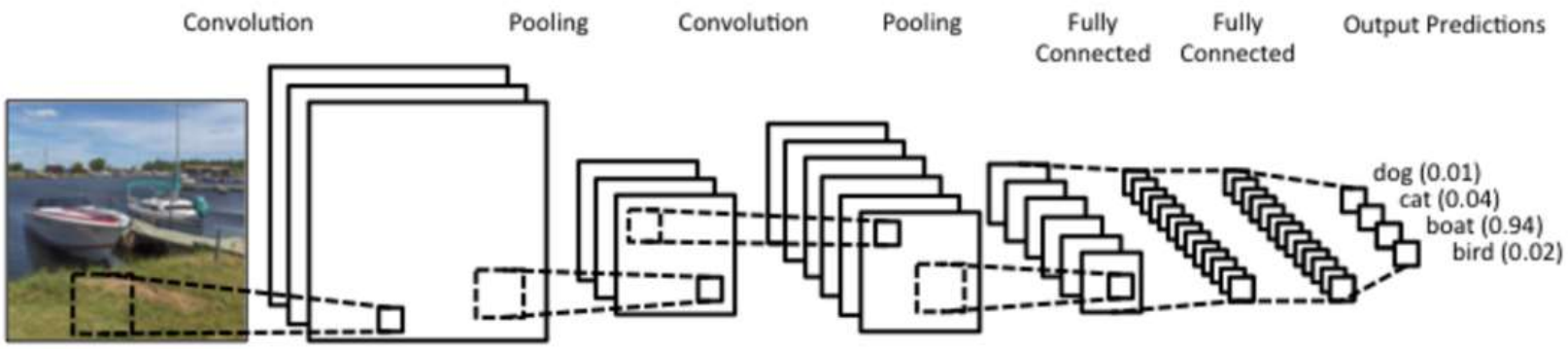


Image and information source: Kathryn Hume, used with permission

Supervised learning flow

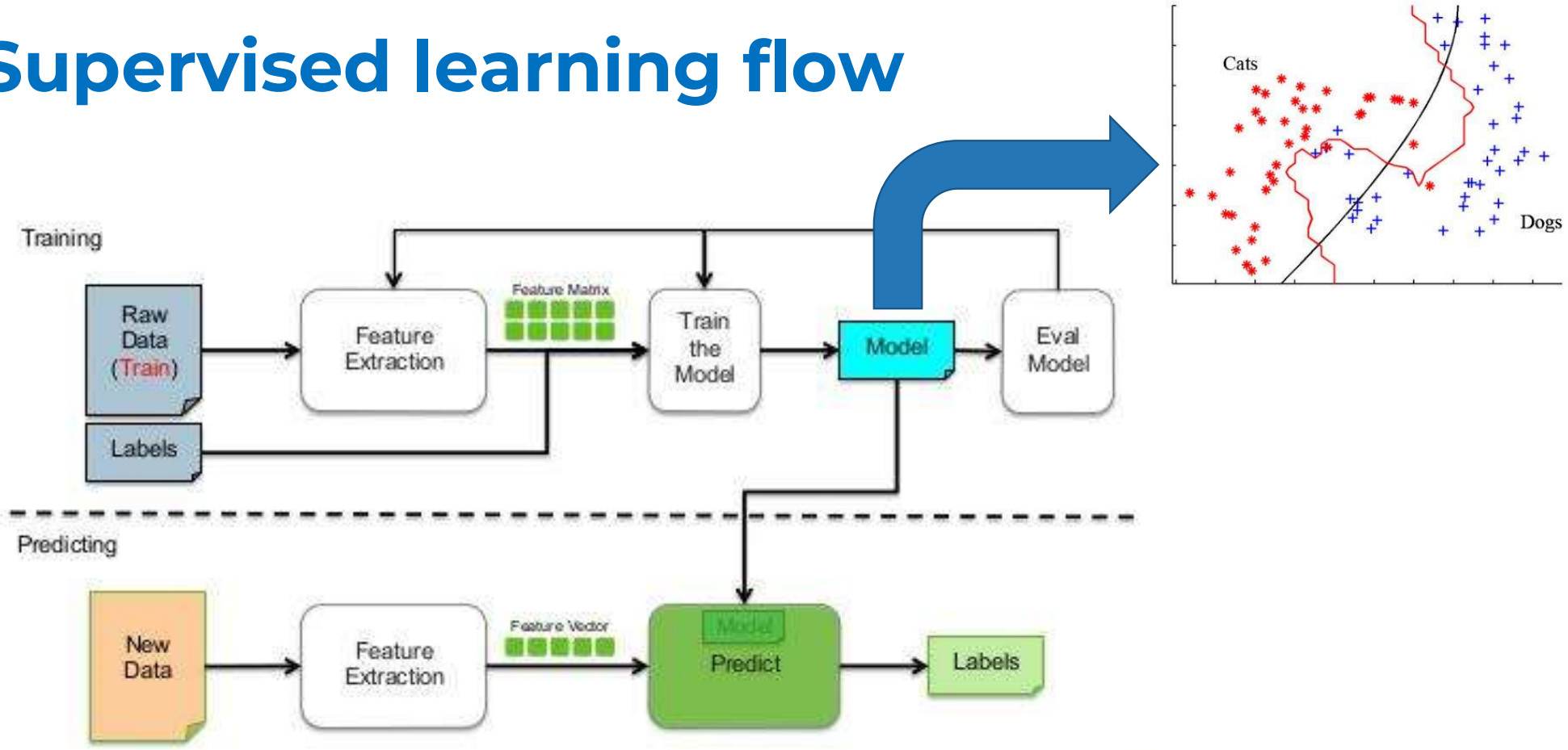
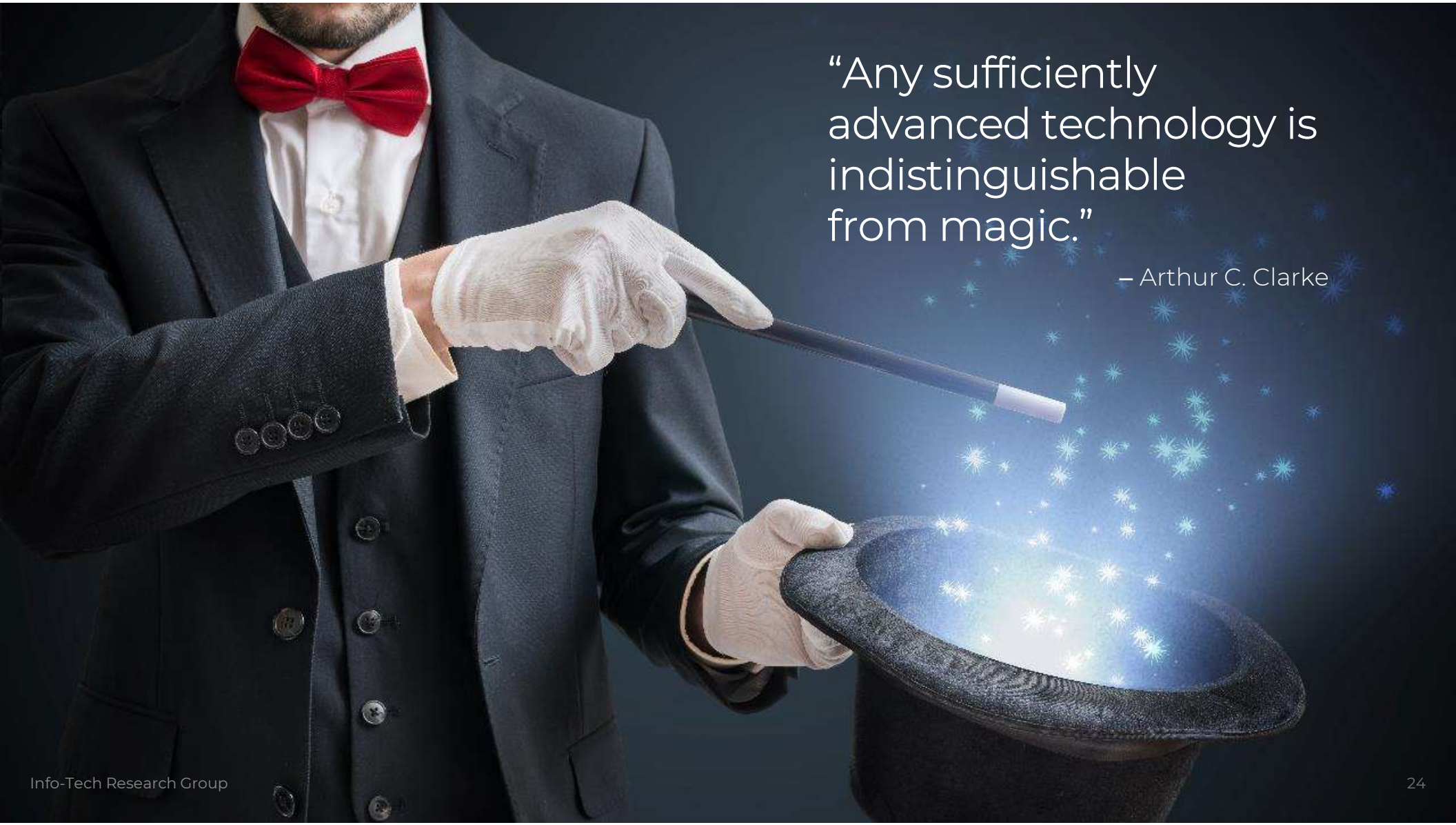
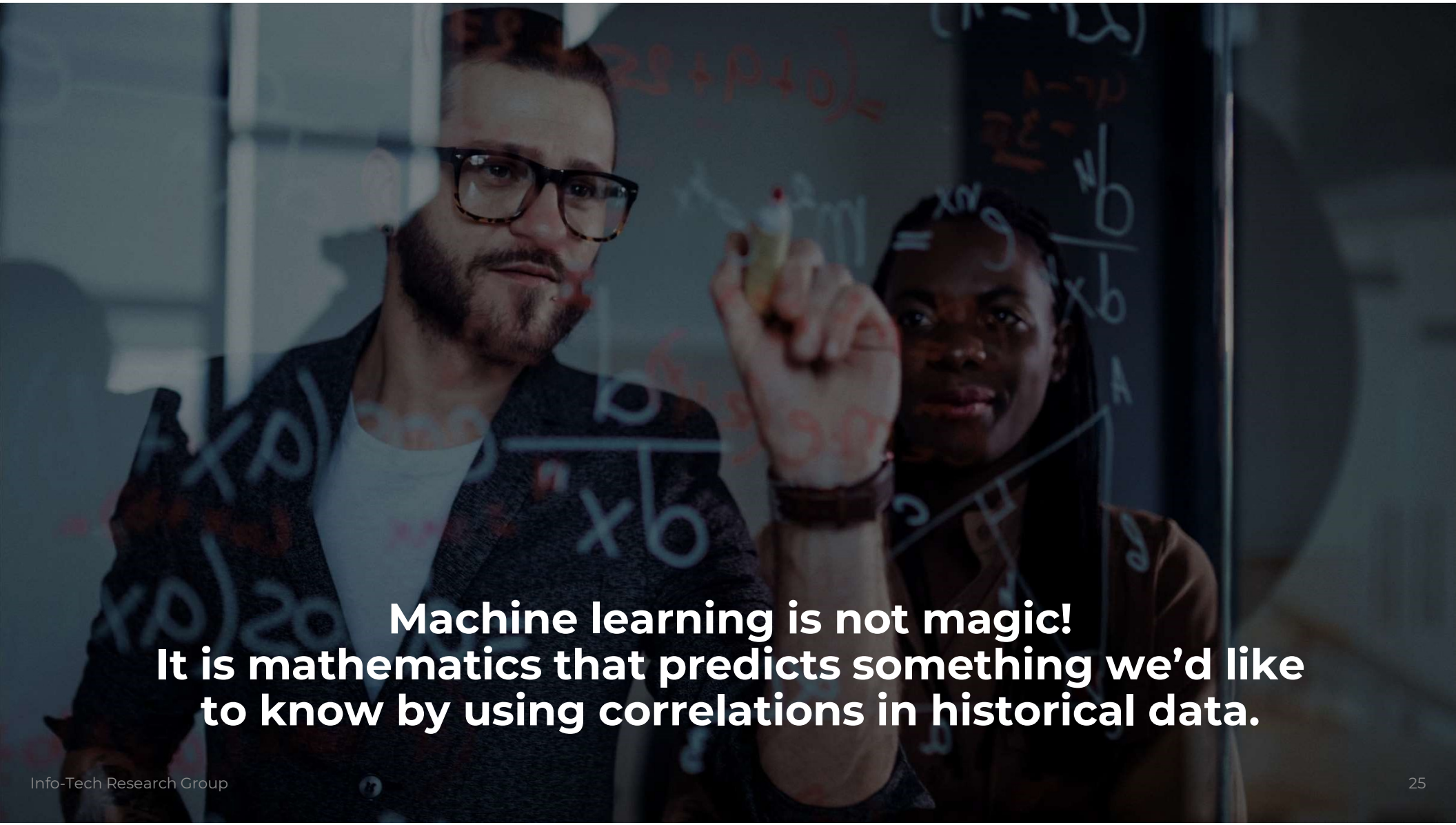


Image source: Hortonworks, used with permission


“Any sufficiently advanced technology is indistinguishable from magic.”
– Arthur C. Clarke


Machine learning is not magic!
It is mathematics that predicts something we'd like to know by using correlations in historical data.

“We propose that a 2-month, 10-man study of artificial intelligence be carried out…”

Image source: Computer Science Museum, used with permission

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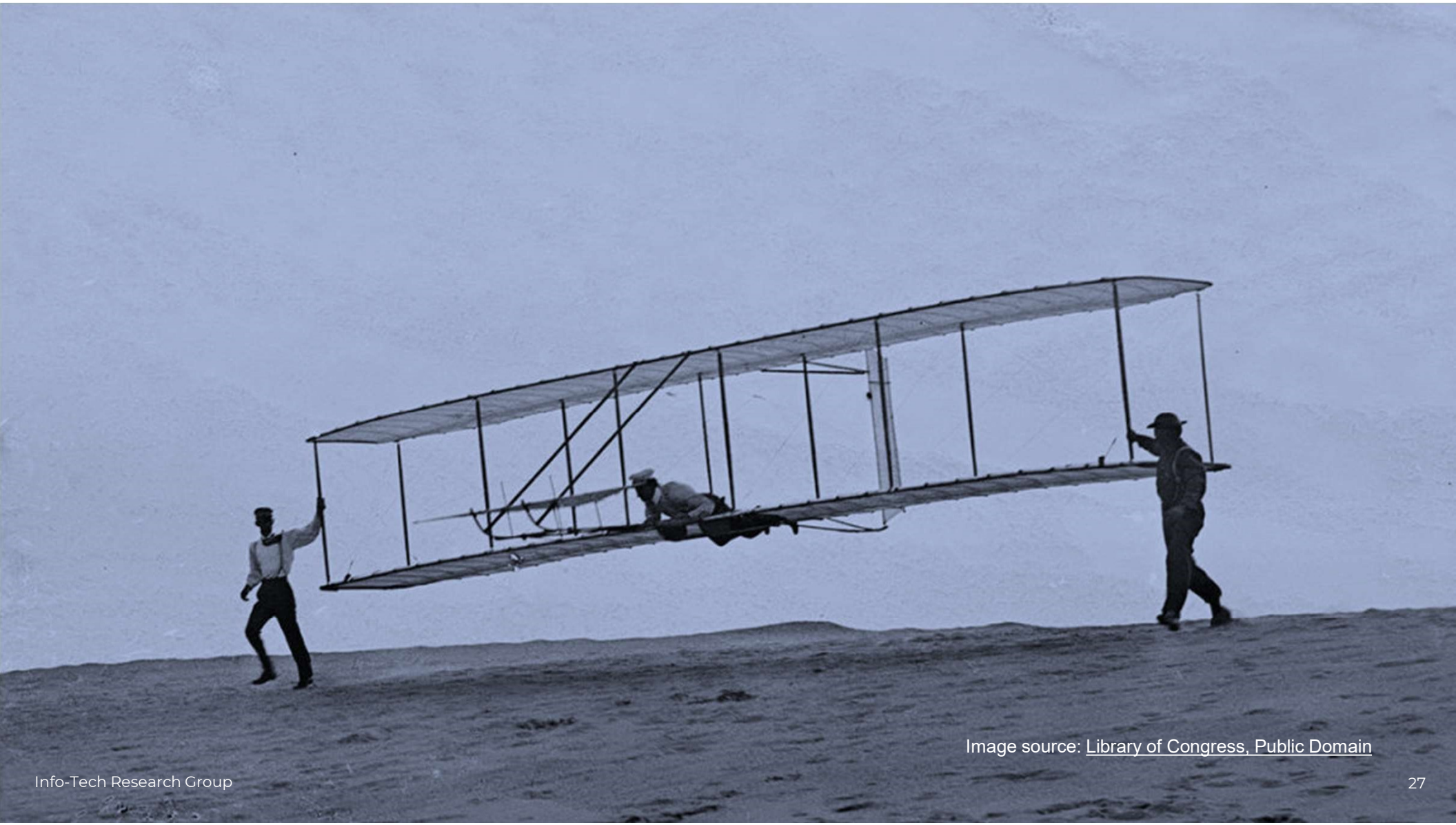


Image source: Library of Congress, Public Domain

What we want from AI

What we've got

Actually, this

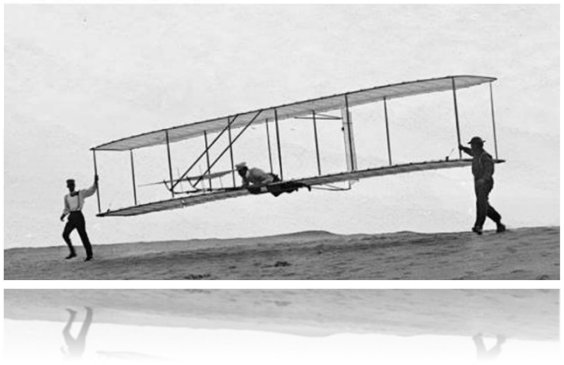
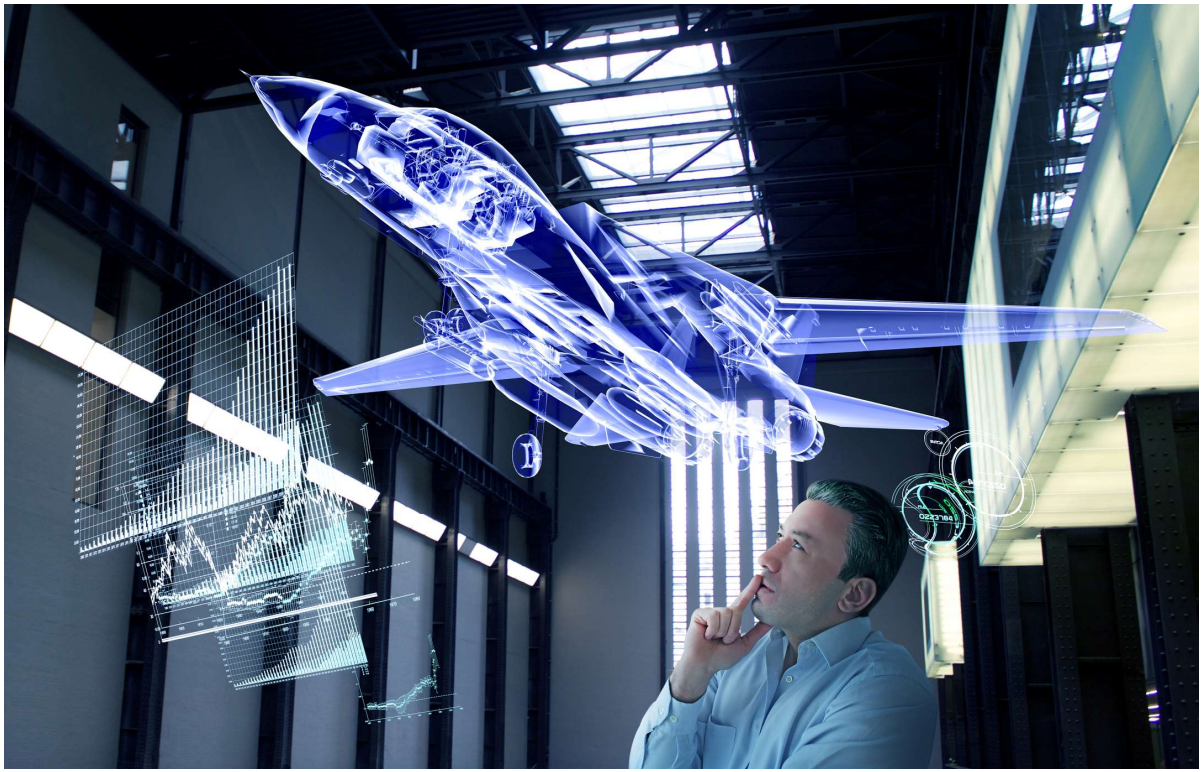


Image source: Library of Congress, Public Domain

"Airplanes don't flap their wings; why should computers think?"

Source: The Atlantic

Building the AI “plane” while flying it

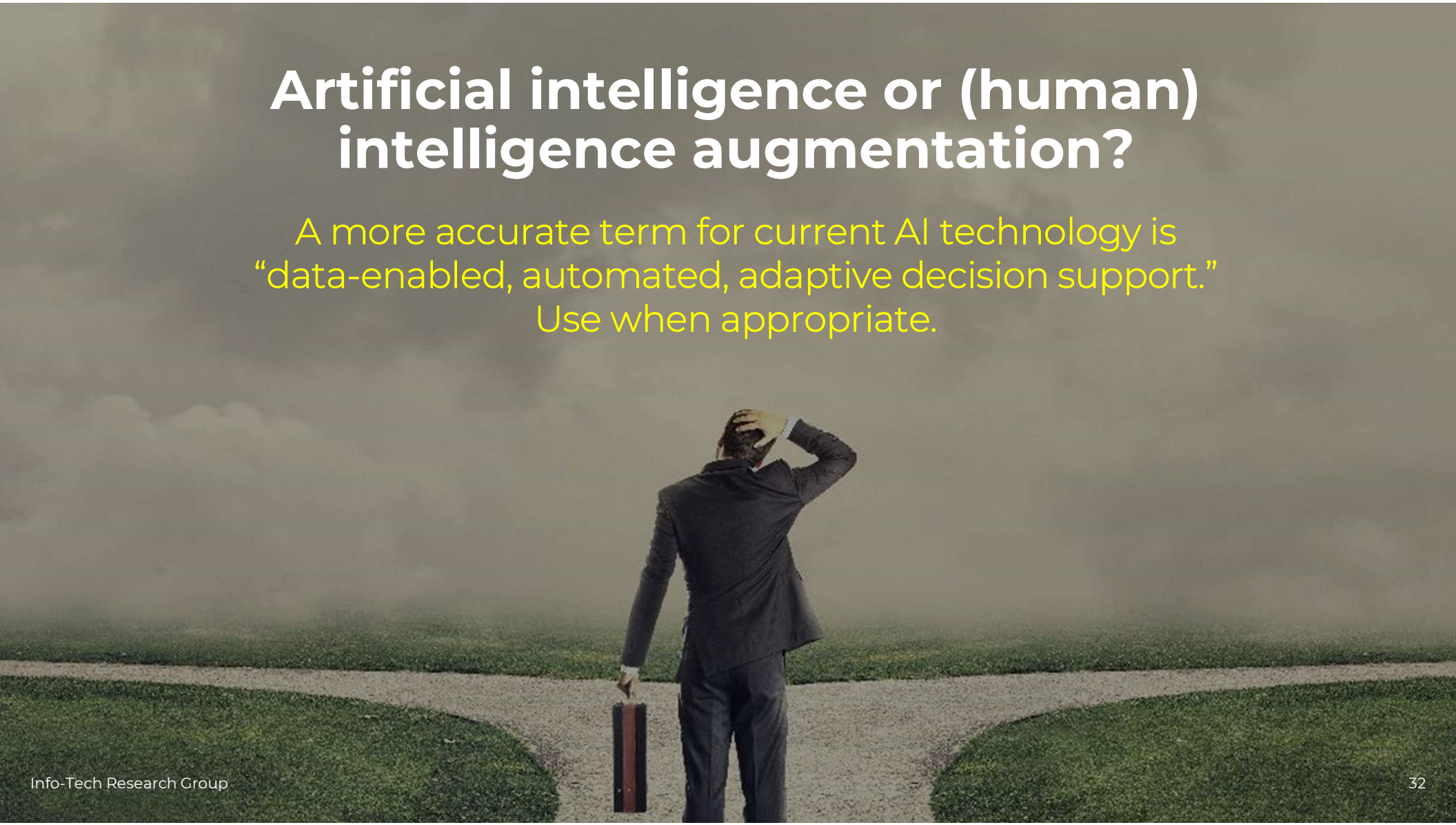


“The quest for ‘artificial flight’ succeeded when the Wright brothers and others stopped imitating birds and started…learning about aerodynamics.”

– Peter Norvig and Stuart Russell in The Atlantic

Artificial intelligence or (human) intelligence augmentation?

A more accurate term for current AI technology is "data-enabled, automated, adaptive decision support." Use when appropriate.



AI as artificial perception

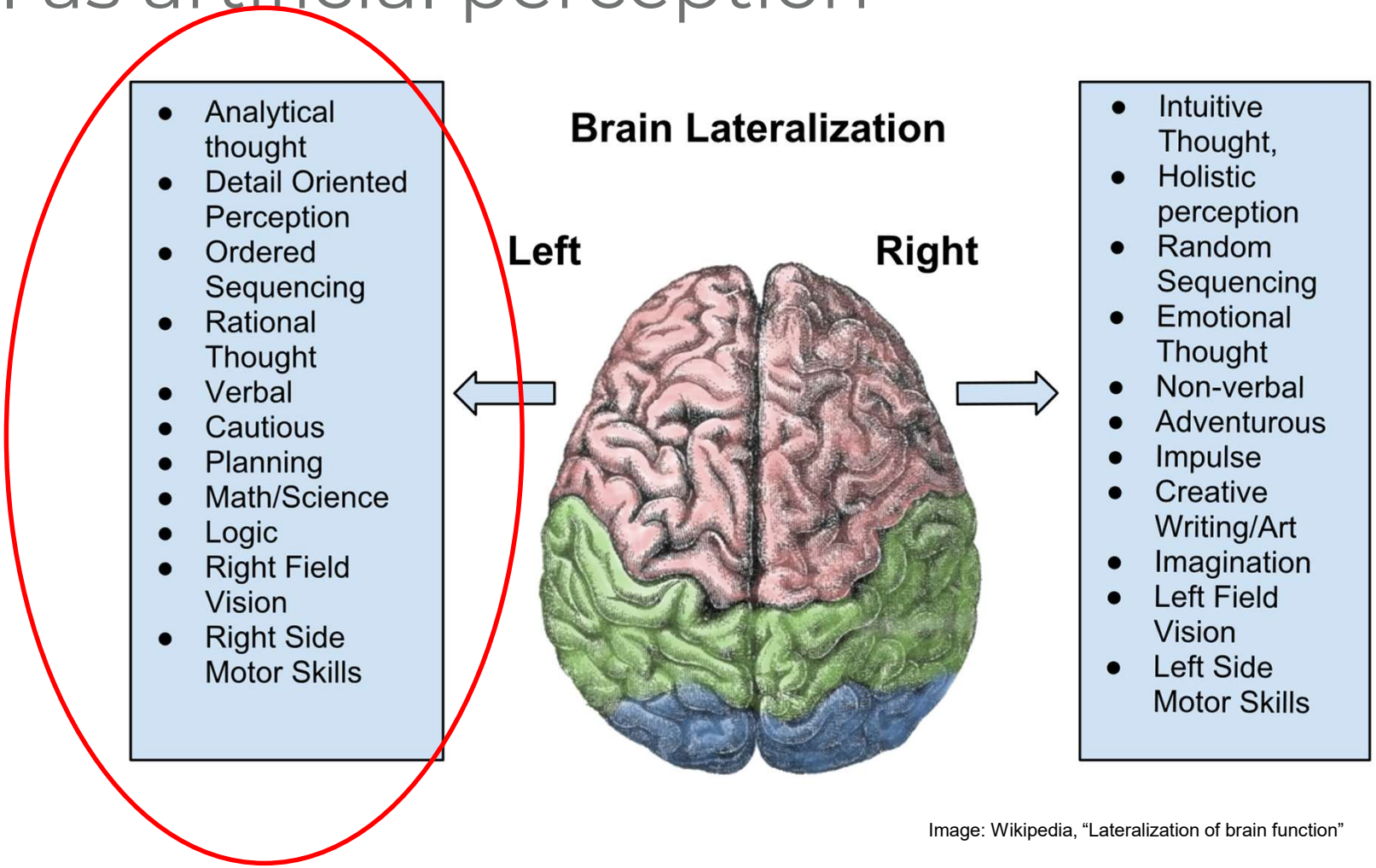


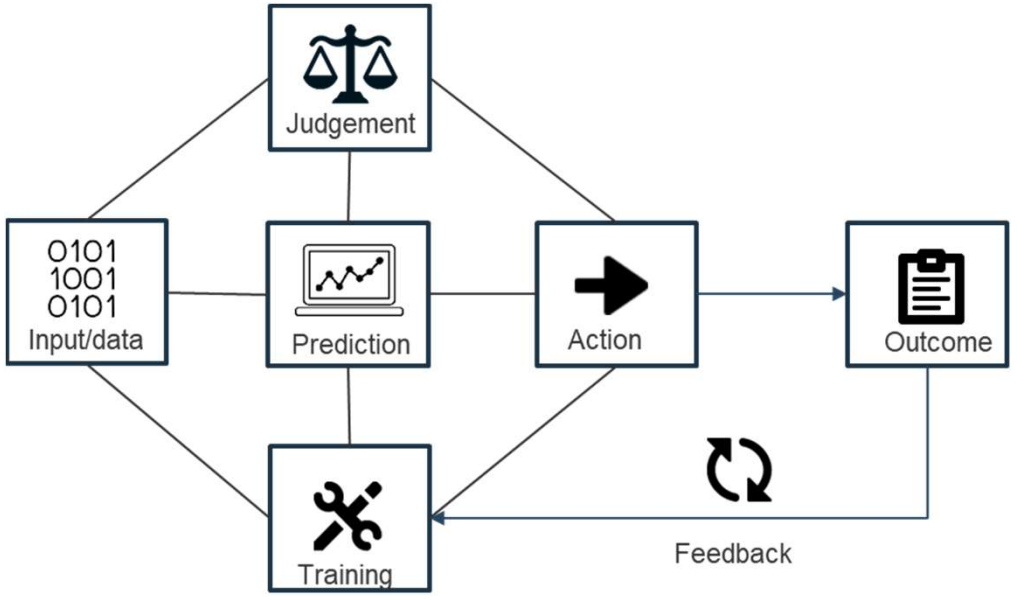
Image: Wikipedia, “Lateralization of brain function”

We are at the dawn of the new era in decision-making

Machines are also better suited than humans to make predictions involving a large number of input dimensions or a complex interaction among the variables.

Humans, on the other hand, are exceptionally good at making predictions when data is not available or limited, and in situations requiring analogy, causal inference or judgement.

Anatomy of a decision-making process



Based on: Ajay Agrawal et al., *Prediction Machines,* 2018

AI is Automating Many Processes Across all Industries

The situation before AI

In organizations in all of human history, **humans** have made decisions. In modern organizations, this required defined processes for the intake of information, as well as business rules for taking certain actions in defined situations. This in turn made making decisions more efficient and provided opportunities for making smarter processes.

Enter AI

With modern AI technologies, business processes are not only replaced, but also redefined. Taking in large amounts of data, algorithms can be created that make those business decisions based on identified patterns. Not only that, but the algorithms can adapt to incoming data to make the smartest decisions possible.

So, what's changing?

Processes

- **Finance:** AR, AP, expenses, reconciliation, and closure of financial ledgers; audit and compliance; fraud detection; touchless transactions, e.g. automatic requisitioning of services/supplies from third-party preferred supplier; provisioning of costs within the budget; new project planning.
- **HR:** Talent sourcing, selection, and recruitment.
- **Operations:** Intelligent routing and processing of customer requests; workforce scheduling; predictive maintenance; inventory management; demand forecasting.
- **Legal:** Legal discovery; contract reviews.
- **IT:** Service desk, automated operations, security.
- **Product design:** Generative design, content creation.

Occupations

- Radiologists
- Taxi and truck drivers
- Insurance claim adjusters
- Cashiers
- Librarians
- Teachers
- Bank tellers
- Executive assistants
- Translators/interpreters
- Reporters
- Postal workers

We are in the 3rd Wave of Business Transformation

Early 1900s: standardization

The first wave took place during the early 1900s, and it involved **standardized processes,** culminating in assembly line and overall processes that could be measured, optimized, and standardized to achieve efficiencies.

1970-1990s: automation

The second wave consisted of **automated processes.** It started in the 1970s and peaked in the 1990s, with the business process re-engineering movement, thanks to advances in information technology: desktop computers, large databases, and software that automated various back-office tasks.

Now: adaptation

Now the third wave is taking place and it involves **adaptive processes.** It is ushering new, innovative ways of doing business. Advances in AI open a world of possibilities to reimagine current processes to be more flexible, faster, and **adaptable to the behaviors, preferences, and needs of the workers at a given moment.**

Source: Daugherty and Wilson, *Human + Machine,* 2018

Key takeaways

- AI = ANI = ML It's... Magic! No, it's mathematics.
- Data-enabled, automated, adaptive decision support

For more information, see our blueprints